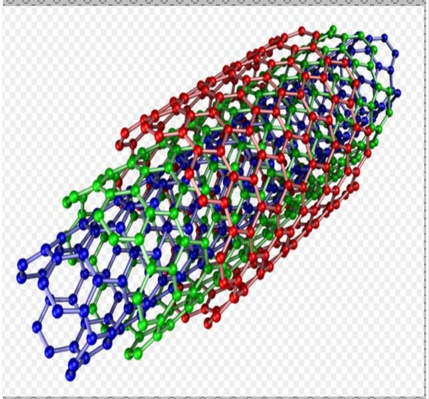

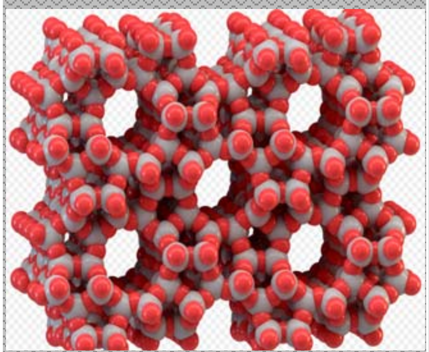

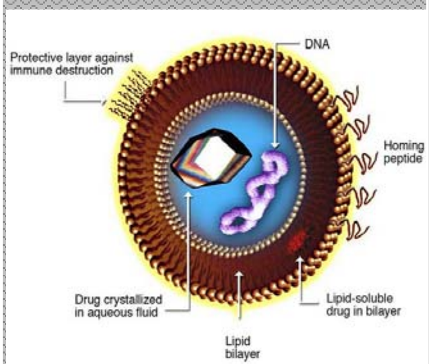

EMGEN Newsletter

Vol. 6, Issue 3

IN THIS ISSUE:

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MICROPOROUS MATERIALS: ZEOLITES

Zeolites are tiny permeable, aluminosilicate crystals exerted as catching and reagents in the reactions. The word zeolite was initially used in 1756 by A.F. Cronstedt, who detected that after quickly warming the substance, it created great quantities of water vapor that had been absorbed by the substance. According to this, he named the substance *zeolite*, from the Greek meaning "to boil" and *lithos*, meaning "stone".

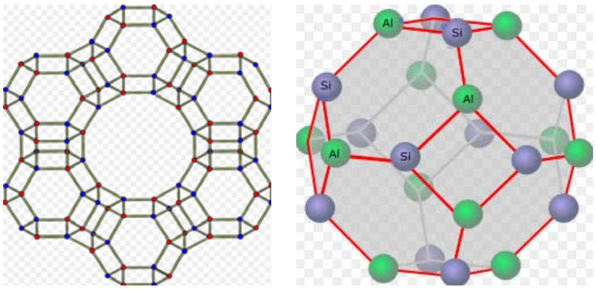

Figure 1: Structure of zeolite

Zeolites are happened indigenously, however, they can be synthesized technologically in a large scale. Nowadays, 229 unique zeolite frameworks have been identified. Zeolites have a permeable construction that can contain a varied range of cations, e.g. Na^+, K^+, Ca^{2+}, Mg^{2+} and others. These positive ions are rather held and can be exchanged for others in a contact solution. Some of the most usual mineral zeolites are analcime, chabazite, clinoptilolite, heulandite, natrolite, phillipsite, and stilbite. A sample mineral formulation is: $Na_2Al_2Si_3O_{10}{\cdot}2H_2O$, which is known as natrolite. Indigenous zeolites are hardly genuine and are polluted by other metals, quartz, minerals, or other zeolites. For this reason, indigenous zeolites are excluded from many important profitable applications where purity is essential. Artificial zeolites have some advantages over indigenous zeolites. The artificial zeolites are generated in an identical and genuine form. It is also possible to generate zeolite constructions that do not exist in nature. Zeolite A is a well-known model. The primary crude ingredients applied to generate zeolites are alumina and silica, which are amid the most plenteous inorganic elements. Zeolites are the aluminosilicate of microporous solids known as "molecular sieves." The term molecular sieve refers to a special property of these materials to selective molecules based on size in the exclusion process. This is because of a normal orifice construction of molecular structure of zeolite. The maximum size of the molecular or ionic objects that can enter the pores of a zeolite is controlled by the dimensions of the channels.

Zeolites are commonly grouped by the circular dimension of the construction, for instance, the term "8-ring" states a barred circle that is constructed from 8 tetrahedral harmonized silicon (or aluminum) atoms and 8 oxygen atoms. These circles are not usually fully equal because of a range of effects, comprising strain induced by the bonding between units that are needed to produce the overall structure, or coordination of some of the oxygen atoms of the rings to cations within the structure. Consequently, the holes in numerous zeolites are not tubular. Some of the biochemical and biomedical submissions of zeolites, particularly the natural zeolite such as heulandite, clinoptilolite and chabazite have been ongoing. The zeolite is used as a molecular sieve to create purified oxygen from the air and trap impurities, in a process involving the absorption of nitrogen.

What are special characterizes of zeolites?

- They have pores with molecular dimensions leads to shape selectivity.
- There is a narrow range of pores size in the solid because the materials are crystalline.

Zeolites have several applications in industry. For example, zeolites have been used for ion exchange and removal of heavy metals, absorption of gases and water softening.

Synthesis of zeolite beta

There are numerous varieties of artificial zeolites that have been modeled by slow crystallization of a silica-alumina gel in the attendance of biological patterns. One of the most significant procedures applied to create zeolite is sol-gel processing. The assets of artificial zeolite rely on the reaction mixture arrangement, pH, temperature, process duration, and nature of patterns. In the sol-gel procedure, other elements (metals, metal oxides) may be simply combined. The silicalite sol shaped by the hydrothermal technique is very resistant. The simplicity of gauging up this procedure makes it a preferred method for zeolite production. Zeolite beta has an unlimited industrial talent and has a huge advantage owing to its great acidity and exotic pore structure and can be applied as catalyst in a wide range of hydrocarbon alteration procedures comprising isomerization, hydration of olefins, desulfurization, hydrocracking and polymerization. Production of zeolite beta was done in the attendance of a natural pattern and commercial materials such as silica gel and sodium aluminate. The production parameters including mole ratios of SiO_2/ Al_2O_3 and Na_2O/ Al_2O_3, temperature and time of crystallization were evaluated and optimum conditions for production of this zeolite were obtained. Different techniques such as X-ray diffraction (XRD), infrared spectroscopy (IR), and scanning electron microscopy (SEM) were

Tetraethylammonium hydroxide (TEAOH) was applied as a natural pattern. Silica gel powder and a suitable quantity of TEAOH were added to sodium aluminate. The attendance of TEAOH as a pattern is vital for this technique. Zeolites are extensively applied as ion-exchange subjects in laboratory and commercial water cleansing, tempering, and additional submissions. In chemistry, zeolites are applied to distinct fragments (just fragments with definite size and form can transmit), and as snares for fragments, so they can be studied. Zeolites are correspondingly extensively applied as reagents and sorbents. Their well-shaped pore construction and adaptable acidity make them extremely active in a great range of reactions. Zeolites have the possibility to deliver exact and definite separation of gases comprising the elimination of H_2O, CO_2 and SO_2 from low-grade natural gas streams.

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BIOTECHNOLOGY, ITS FIELDS AND GREAT MANY PRODUCTS

Biotechnology can be generally described as any technical application that applies natural methods, living creatures (microorganisms, plant or animal cells) or their crops and having a wide range of practice and precise applications that can improve our lives. As such, biotechnology has existed since the human being first exerted fermentation to make bread, yoghurt and beer; nevertheless, modern biotechnology alludes to the understanding and application of genetic information on animal and plant species. Genetic engineering customizes the functioning of genes in the same species or moves genes across species causing in Genetically Modified Organisms (GMOs). This new biotechnology has provoked a multitude of products and processes in the life sciences fields. In the health sector, human insulin was the primary commercially successful product. Biotechnology is generally regarded as both science and technology. Biotechnology contains biology; botany, the study of plants; zoology, the study of animals; physiology; microbiology; cell biology; molecular biology; biochemistry; ecology; embryology; genetics; population genetics; epigenetics; proteomics; bioinformatics; biochemistry; chemical engineering and etc. All disciplines relating to altering living organisms for any purpose can be considered as a branch of biotechnology.

Biotechnology is a broad term; it is difficult to define its exact boundaries. Some scientists (esp. in Europe) group the field under red biotechnology and green biotechnology. Red biotechnology relates to medicine, and green biotechnology identifies with food. Since much of the genetic engineering today is aimed at solving issues relating to food and health, biotechnology can be broken into two practical categories, agriculture (e.g. bio-fertilizers) and medicine (e.g. penicillin). Some divide biotechnology into white and blue. White biotechnology, also called industrial biotechnology, focuses on using such natural procedures as fermentation and enzyme synthetize to create bio-products heretofore created with chemicals. Bio-plastics and biofuels made of plants (renewable and eco-friendly) instead of petroleum (non-renewable and environmentally harmful) are examples of white biotechnology. Blue biotechnology comprises all features of marine biology and genomics (the use of biotechnology in DNA sequencing, gene mapping, and etc.). Briefly, all the categories aims to find solutions to nowadays difficulties, through the natural world. One can classify bio-products into three major categories on the basis of market volume, market price and purity requirements. These comprises (a) very high value, low volume crops as well as healing proteins and enzymes, factor VIII, interferon, urokinase and etc. with very high pureness and the size made is in the range of grams to kilograms; (b) high value, low volume, high purity crops as well as analytical enzymes (e.g. luciferase and glycerophosphate dehydrogenase), human growth hormone, tissue plasminogen activator, monoclonal antibodies and insulin manufactured in tens or hundreds of kilograms; and (c) bulk industrial crops of comparatively low purity such as organic acids, amino acids, ethanol, antibiotics, proteases and amylases created in hundreds of kilograms to tons in amount.

How does modern biotechnology work?

All organisms are made up of cells that are programmed by the same basic genetic material, called DNA (deoxyribonucleic acid). Each unit of DNA is formed by a combination of the following nucleotides - adenine (A), guanine (G), thymine (T), and cytosine (D) - as well as a sugar and a phosphate. These nucleotides pair up into strands that twist together into a spiral structure called a "double helix". This double helix is DNA. Segments of the DNA dictate individual cells how to produce specific proteins. These segments are genes. It is the presence or absence of the precise protein that springs a creature a trait or feature. Above 10,000 dissimilar genes are found in most animals and plants. This whole makeup of genes in a creature is ordered into chromosomes inside the cell nucleus. The process by which a multicellular creature develops from a single cell through an embryo stage into an adult is ultimately controlled by the genetic information of the cell, as well as the interaction of genes and gene products with environmental factors. When cells reproduce, the DNA strands of the double helix separate. Since nucleotide A always pairs with T and G always pairs with C, each DNA strand serves as an exact blueprint for a particular protein. Except for mutations or mistakes in the replication process, a single cell is equipped with the information to replicate into millions of identical cells. Since all creatures are shaped from the similar kind of genetic substances (nucleotides A, T, G, and C), biotechnologists employ enzymes to cut and eliminate DNA components from one creature and recombine it with DNA in another creature. This is called recombinant DNA (rDNA) technology, and it is one of the fundamental tools of modern biotechnology. rDNA technology is the laboratory manipulation of DNA in which DNA, or components of DNA from different sources, are cut and recombined using enzymes.

This recombinant DNA is then injected into a living creature. rDNA knowledge is typically applied equivalent to genetic engineering. rDNA knowledge permits scholars to change genetic material among distinct creatures to produce favorite crops or features or to eliminate unwanted features. Genetic engineering is the technique of removing, altering or adding genes to a DNA molecule in order to change the information it contains. By changing this information, genetic engineering changes the sort or amount of proteins an organism can generate. Genetic engineering is employed in the manufacture of drugs, human gene therapy, and the expansion of genetically improved plants.

For instance, in 1995, ILTAB described the initial transfer by the help of biotechnology of a resistance gene from a wild species of rice to a vulnerable cultivated rice variety. The relocated gene expressed resistance to *Xanthomonas oryzae*, a bacterium which can destroy the crop. The resistance gene was relocated into susceptible rice varieties that are cultivated on more than 24 million hectares around the world. In 1992, Monsanto Company effectively injected a gene from a bacterium into a potato. This gene amplifies the starch amount of the potato. Developed starch amount reduces oil inhibition through cooking, thus dropping the price of handling French chips and decreasing the fat amount in the finished product. This product is still awaiting final development and approval. Tomatoes and other crops comprising amplified levels of definite nutrients, as well as vitamin C, vitamin E, and or beta carotene, are made and helps defend beside the risk of chronic illnesses, as well as some tumors and heart sickness.

Similarly, presenting genes that enhance available iron levels in rice is a possible option for iron shortage, an ailment that distresses more than two billion persons and causes anemia in about half that number. Biotechnical approaches are now applied to harvest various proteins for medicinal and other particular uses. An inoffensive strain of *Escherichia coli*, received a copy of the gene for human insulin and can produce insulin to treat diabetes in hominids. Microbes can be altered to crop other enzymes as well. In the future, these microbes could be cultured in the colonic tract of individuals with digestive enzyme deficiencies. Products of current biotechnology comprise simulated blood vessels from collagen ducts covered with a layer of the anticoagulant heparin. Gene therapy – changing DNA in cells of a creature to cure a sickness – is one of the most effective areas of biotechnology. New genetic treatments are being industrialized to treat ailments such as cystic fibrosis, AIDS and cancer.

Environmental biotechnology

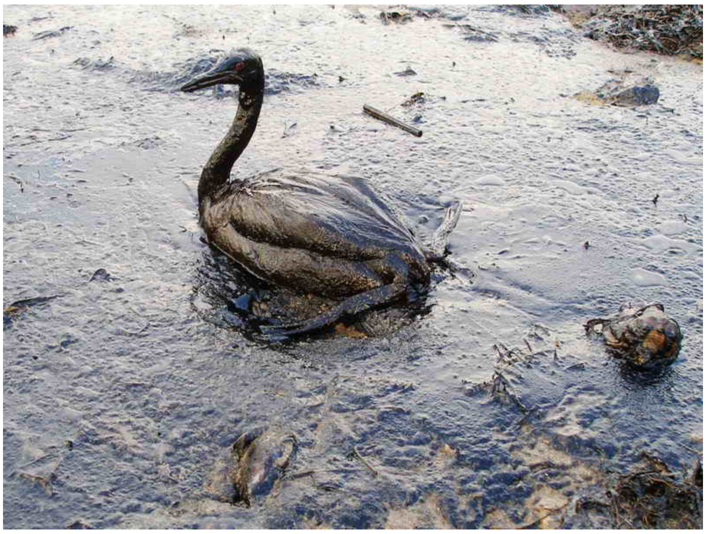

Figure 1: A bird covered in oil from the Black Sea oil spill.

Environmental biotechnology is applied in garbage management and contamination avoidance. It can cleaning numerous trash more competently than usual approaches and significantly decrease our need to land-based removal approaches. Every creature consumes nutrients to live and produces other materials as a result. Various creatures require diverse kinds of nutrients. Some bacteria can cultivate on the chemical constituents of trash. Environmental engineers use bioremediation, the widest application of environmental biotechnology, in two basic ways. They insert nutrients to stimulate the activity of bacteria already present in the soil at a waste locality, or add new bacteria to the soil. The bacteria digest the waste at the location and change it to harmless byproducts. After the bacteria use up the waste materials, they die off or return to their normal population levels in the environment. In this manner, biological treatment of wastewaters can be carried out by same ways.

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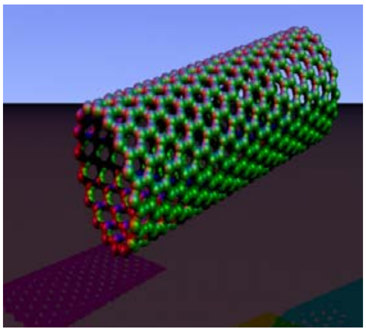
WIRELESS, WEARABLE TOXIC-GAS DETECTOR



MIT academics have established inexpensive biochemical sensors, prepared from chemically improved carbon nanostructures that permit smartphones or further wireless apparatuses to track the poisonous gases. By these devices, the academics expect to enterprise light, inexpensive radio-frequency identification (RFID) devices to be applied for individual protection and security. Such devices can be used by militaries in the battleground to quickly sense the attendance of biochemical weaponries as well as nerve gas or stifling factors and by individuals who work nearby hazardous substances disposed to permeation. The device is a circular object filled with carbon nanotubes, which are generally extremely conductive but have been covered in an insulating substance that saves them in an extremely resistive condition. When subjected to some poisonous gases, the protecting substance fractures, and the nanotubes become meaningfully more conductive.

This directs an indication that is legible by a smartphone with near-field communication (NFC) technology, which permits devices to transfer data over near spaces. The sensors are sentient sufficient to identify less than 10 ppm of objective poisonous gases in about 5 seconds that can be done with laboratory equipment, such as gas chromatographs (GC) and spectrometers, that is more expensive and needs expert operators.

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2. https://en.wikipedia.org/wiki/Carbon_nanotube

A STRATEGY FOR 'CONVERGENCE' RESEARCH TO TRANSFORM BIOMEDICIN

What if missing organs could be regenerated? Tumors were spotted quicker with blood or urine tests, rather than aggressive surgeries? What if medicines transported via nanoparticles to precise tissues or even cells, reducing undesirable adverse properties?

Though such inventions may seem ultramodern, researchers are discovering these and other hopeful methods. Convergence discipline has progressive ideas on countless aspects, from nanotechnology to regenerative tissues. Convergence discipline could permit reassemble the genes of parasites to eliminate numerous diseases such as Zika, dengue, and malaria. They might aid resolve the emerging medicine-resilient microbial strains, which infected over 2 million individuals in the U.S. yearly. Convergence-centered immunotherapy could stimulate an individual's immune system to combat tumor and reorganizing T-cells or antibodies to discover and attack tumor cells. Big-data methods may be applied to produce and evaluate vast quantities of data on individual’s dispersal to industrial substances, ecological poisons, and infectious particles, generating a novel field of "chemistry of nurture".

Reference: https://www.sciencedaily.com/releases/2016/06/160623145936.htm

GREEN CHEMISTRY

Scope: The use of biotechnology alternatives in chemistry , renewable energy, and sustainable resources.

Impact Factor: 8.506

ISSN: 1463-9262

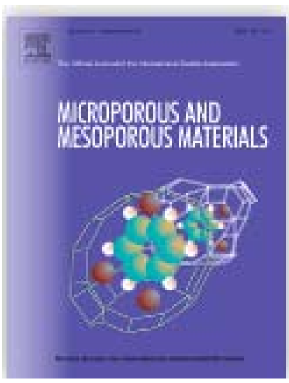
HEALTH & PLACE

Scope: Study of all aspects of health and health care.

Impact Factor: 2.44

ISSN: 1353-8292

MICROPOROUS AND MESOPOROUS MATERIALS



Scope: Novel and significant aspects of porous solids classified as either microporous and mesoporous . Typical example are zeolite and zeolite-like materials.

Impact Factor: 3.34

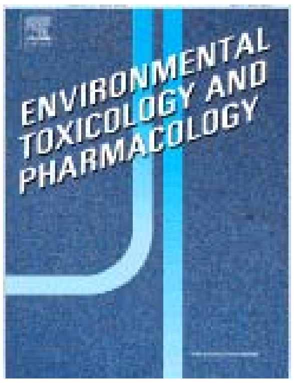
ISSN: 1387-1811

ENVIRONMENTAL TOXICOLOGY AND PHARMACOLOGY

Scope: Toxic and pharmacological effects of drugs and environmental contaminants in animals and man.

Impact Factor: 2.18

ISSN: 1382-6689

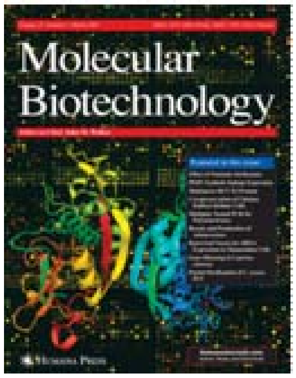


MOLECULAR BIOTECHNOLOGY

Scope: Application of molecular biology to both basic and applied research in the field of biotechnology: stability and expression of cloned gene products, cell transformation, mass spectrometry, bioinformatics, pharmaceutical and health care products.

Impact Factor: 1.75

ISSN: 1073-6085

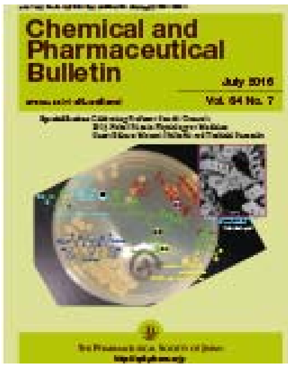


CHEMICAL AND PHARMACEUTICAL BULLETIN

Scope: Promoting the pharmaceutical sciences.

Impact Factor: 1.16

ISSN: 1347-5223



Announcements

http://asar.org.in/Conference2016/Pondicherry/ICMHS3/

http://www.icccp.org/

http://www.icbbb.org/

CARBON NANOTUBE

Carbon nanotubes (CNTs) are allotropes of carbon with a tube-shaped nanostructure. These fragments have unique assets, which are usable for nanotechnology, electronics, optics, and other arenas of resources discipline and machinery. Especially, due to their strange thermal conduction ability and mechanical and electrical specifications, they have numerous uses as additives to several operational elements. Namely, nanotubes form a small section of the ingredients in some baseball rackets, golf sticks, and car equipment. Nanotubes are a subcategory of the fullerene group. Their title is derived from their extensive, vacant shape with the barriers shaped by panels of carbon, known as graphene.

These panels are wrapped at precise positions, and the arrangement of the wrapped position and span chooses the nanotube specifications, e.g. whether the distinct nanotube cover is a metal. Nanotubes are grouped as solo-covered nanotubes and multi-covered nanotubes. Distinct nanotubes normally arrange themselves into "ropes" retained to by van der Waals powers. Practical quantum chemistry, in particular, zonary hybridization well defines biochemical attachment in nanotubes. The biochemical attachment of nanotubes is constructed completely of sp^2 attachments, alike those of graphite. These attachments, which are more durable than the sp^3 attachments are present in alkanes and diamond, make nanotubes available with exclusive power.

Reference: https://en.wikipedia.org/wiki/Carbon_nanotube

ZEOLITE

A microporous substance is a substance comprising holes with thicknesses below 2 nm. Samples of microporous substance comprise zeolites and metal-originated structures. Spongy constituents are categorized into numerous classes by their size. The endorsements of a board assembled by the International Union of Pure and Applied Chemistry (IUPAC) grouped these as: 1) microporous substances have hole spans of below 2 nm, 2) mesoporous substances have hole spans among 2 nm and 50 nm, and 3) macroporous substances have hole spans of larger than 50 nm.

Reference: https://en.wikipedia.org/wiki/Zeolite

LIPOSOME

A liposome is a circular vesicle with minimum of a lipid bilayer. The liposome may be applied as a carrier for directing nutrients and medicines. The chief categories of liposomes are the multilamellar vesicle (MLV), the small unilamellar liposome vesicle (SUV), and the large unilamellar vesicle (LUV). Liposomes do not be mixed up with micelles and opposite micelles built of monolayers. A liposome has a watery dilution core enclosed by a hydrophobic sheath, in the shape of a lipid bilayer; hydrophilic solvents melted in the core cannot freely cross the bilayer and have connections with the bilayer. A liposome may be therefore filled with hydrophobic and/or hydrophilic particles. To transport the particles to a target position, the lipid bilayer can be mixed with other bilayers such as the cell membrane; consequently, they transport the contents; this is a difficult and non-automatic incident. By organizing liposomes in a dilution of DNA or medicines, they can be transported through the lipid bilayer, however they will disperse irregularly.

Reference*:* https://en.wikipedia.org/wiki/Liposome